

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 05 April 2001 (05.04.01)	
International application No. PCT/GB00/02224	Applicant's or agent's file reference 1650/PCT
International filing date (day/month/year) 08 June 2000 (08.06.00)	Priority date (day/month/year) 18 June 1999 (18.06.99)
Applicant BURA, Michael, John et al	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
 15 January 2001 (15.01.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Anman QIU Telephone No.: (41-22) 338.83.38
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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 1650/PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/GB00/02224	International filing date (day/month/year) 08/06/2000	Priority date (day/month/year) 18/06/1999
International Patent Classification (IPC) or national classification and IPC E01D19/06		
Applicant VEXCOLT (UK) LIMITED et al.		



1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 6 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 15/01/2001	Date of completion of this report 17.09.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Saretta, G Telephone No. +49 89 2399 7323 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02224

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-4 with telefax of 15/06/2001

Claims, No.:

1-11 with telefax of 15/06/2001

Drawings, sheets:

1/2,2/2 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/GB00/02224

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-11
	No: Claims
Inventive step (IS)	Yes: Claims 1-11
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-11
	No: Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

R l t m V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. The subject-matter of claim 1 is novel (Article 33(2) PCT) because none of the cited documents disclose the combination of features of claim 1. Claims 2-11 are dependent claims and therefore also comprise novel subject-matter.
2. The subject-matter of claim 1 comprise an inventive step (Art. 33(3) PCT).
- 2.1 Document US 4 030 156 A (=D1) is regarded as being the closest prior art to the subject-matter of claim 1, and shows (see fig. 2):

A bridge joint 10 for joining two sections 11, 12 of a roadway of a bridge, the bridge joint comprising:

a plurality of roadway beams 14 extending across the roadway and including:
 opposite edge beams 27 ("housing", see column 3, line 29) having support formations extending therealong, the edge beams being adapted to be fixed to respective opposite ones of the roadway sections and
 intermediate beams 14 ("beams", column 2, lines 65-68);

a plurality of crossbeams 16, 17 ("proportioning bars", column 3, lines 4-6) extending between the opposite edge beams,
 the crossbeams having end formations 21 which are complementary to the support formations of the edge beams (see fig. 2),
 the crossbeams being supported by engagement of the end formations with the support formations, whereby the crossbeams remain mutually parallel as the edge beams move with respect to each other (see fig. 3 and fig. 4), at least whilst the edge beams remain parallel and
 the crossbeams and the intermediate beams being adapted for support of the intermediate beams on the crossbeams (see column 3, line 5); and

spacing features 18, 19, 20 fixed on at least some of the crossbeams and co-operating with the intermediate beams for evenly spacing the latter between the edge beams (see fig. 2, fig. 3 and column 3, lines 53-54).

- 2.2 In the bridge joint described in D1, the support formations of the opposite edge beams are provided with glide channels 35 and the corresponding end formations of the crossbeams 17 are provided with glide platforms 37, these platforms being provided with low-friction, PTFE surfaces (see fig. 5 and column 3, lines 26-36).

The problem to be solved by the present invention may therefore be regarded as how to simplify the support formations of the opposite edge beams and the corresponding end formations of the crossbeams.

- 2.3 The prior art is not deemed to provide an indication for the skilled man to modify the bridge joint disclosed in D1 in order to arrive at the subject-matter of claim 1. The solution to the problem proposed in claim 1 of the present application is therefore considered as involving an inventive step (Article 33(3) PCT).
- 2.4 Claims 2-11 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to inventive step.
3. The subject-matter of claims 1-11 is open to industrial application.

Re Item VII

Certain defects in the international application

- 4.1 The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).
- 4.2 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 1650/PCT	FOR FURTHER ACTION see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.	
International application No. PCT/GB 00/ 02224	International filing date (day/month/year) 08/06/2000	(Earliest) Priority Date (day/month/year) 18/06/1999
Applicant VEXCOLT (UK) LIMITED et al.		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 2 sheets.



It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.



the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :



contained in the international application in written form.



filed together with the international application in computer readable form.



furnished subsequently to this Authority in written form.



furnished subsequently to this Authority in computer readable form.



the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.



the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of Invention is lacking** (see Box II).

4. With regard to the **title**,



the text is approved as submitted by the applicant.



the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,



the text is approved as submitted by the applicant.



the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.



as suggested by the applicant.



because the applicant failed to suggest a figure.



because this figure better characterizes the invention.

1



None of the figures.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/02224

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E01D19/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 E01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 030 156 A (RAYMOND PAUL J) 21 June 1977 (1977-06-21) the whole document	1,2,10
Y		6,7
A		8,11
Y	US 3 880 540 A (RIZZA MICHAEL C ET AL) 29 April 1975 (1975-04-29) abstract; figures	6,7
A		1

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

15 September 2000

Date of mailing of the international search report

22/09/2000

Name and mailing address of the ISA

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Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Dijkstra, G

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/02224

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4030156 A	21-06-1977	CA 1058932 A	24-07-1979
US 3880540 A	29-04-1975	CA 993245 A	20-07-1976
		CA 1007499 A	29-03-1977
		AT 321349 B	25-03-1975
		AT 328494 B	25-03-1976
		AT 1090273 A	15-06-1975
		AU 462578 B	10-06-1975
		AU 3974472 A	13-09-1973
		BE 780358 A	08-09-1972
		CA 947558 A	21-05-1974
		CH 544848 A	15-01-1974
		DE 2208680 A	31-10-1973
		FR 2129443 A	27-10-1972
		GB 1381530 A	22-01-1975
		IT 957540 B	20-10-1973
		JP 55036761 B	24-09-1980
		LU 64878 A	06-07-1972
		NL 7202994 A,B,	12-09-1972
		NO 130598 B	30-09-1974
		SE 359593 B	03-09-1973
		US 3732021 A	08-05-1973

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau(43) International Publication Date
28 December 2000 (28.12.2000)

PCT

(10) International Publication Number
WO 00/79055 A1

(51) International Patent Classification: E01D 19/06

(74) Agent: BROOKS, Nigel; Hill Hampton, East Meon, Petersfield, Hampshire GU32 1QN (GB).

(21) International Application Number: PCT/GB00/02224

(22) International Filing Date: 8 June 2000 (08.06.2000)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
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60/143.820 14 July 1999 (14.07.1999) US

(81) Designated States (national): AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW.

(84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

(71) Applicant (for all designated States except US): VRX-COLT (UK) LIMITED [GB/GB]; 49 Woolmer Way, Woolmer Trading Estate, Bordon, Hampshire GU38 9QE (GB).

(72) Inventors; and

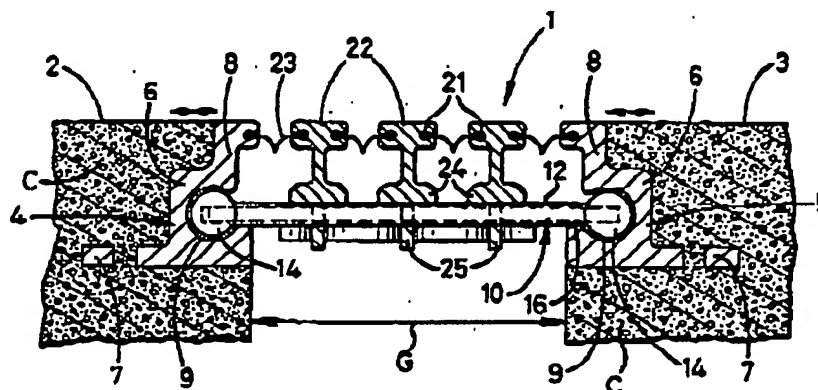
(75) Inventors/Applicants (for US only): BURA, Michael, John [GB/GB]; 2 Ramster Cott, Ramscot, Chiddingfold Godalming, Surrey GU8 4SN (GB). DEVLIN, Seamus, Michael [GB/GB]; 29 High Street, Bursdon, Petersfield, Hampshire GU31 5RX (GB).

Published:

— With international search report.

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: BRIDGE JOINT



WO 00/79055 A1

(57) Abstract: The bridge joint (1) has steel edge beams (4, 5) arranged at the edge of the concrete (C) of the roadway sections. Each edge beam has a circular cross section groove (9), which opens towards the gap (G) between the roadway sections and the opposite edge beam. Cross beams (10) are regularly spaced along the length of the joint, i.e. across the width of the roadway. To each end of the crossbeams, a spherical steel ball (14) is fixed, as by welding or pinning. The balls are sized to fit in the groove (9). The crossbeams support a number of intermediate roadway beams (20). They are of general I-beam shape, with small grooves (21) in their heads (22). The edge flanges (8) of the edge beams also have such small grooves (21). Via these a diaphragm seal (23) is connected between each adjacent pair of roadway beams. Feet (24) of the intermediate beams rest on the crossbeams. These transfer road loads to the edge beams via the balls (14) and lips (16) at the lower side of the mouth of the grooves (9). To maintain the intermediate beams (20) evenly spaced, cams (17) are fixed to the underside of the crossbeams (10). They act against lower extensions (25) of the beams (20), the extensions being fixed to the beams after laying of them on the crossbeams.

INTERNATIONAL SEARCH REPORT

Inter. Appl. No.

PCT/GB 00/02224

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E01D19/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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X	US 4 030 156 A (RAYMOND PAUL J) 21 June 1977 (1977-06-21)	1,2,10
Y	the whole document	6,7
A		8,11
Y	US 3 880 540 A (RIZZA MICHAEL C ET AL) 29 April 1975 (1975-04-29)	6,7
A	abstract; figures	1

☐ Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

* Special categories of cited documents:

* "A" document defining the general state of the art which is not considered to be of particular relevance

* "E" earlier document but published on or after the international filing date

* "T" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

* "O" document referring to an oral disclosure, use, exhibition or other means

* "P" document published prior to the international filing date but later than the priority date claimed

* "I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

* "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

* "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

* "S" document member of the same patent family

Date of the actual completion of the international search

15 September 2000

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22/09/2000

Name and mailing address of the ISA

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Dijkstra, G

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/02224

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 4030156 A	21-06-1977	CA 1058932 A	24-07-1979
US 3880540 A	29-04-1975	CA 993245 A	20-07-1976
		CA 1007499 A	29-03-1977
		AT 321349 B	25-03-1975
		AT 328494 B	25-03-1976
		AT 1090273 A	15-06-1975
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		AU 3974472 A	13-09-1973
		BE 780358 A	08-09-1972
		CA 947558 A	21-05-1974
		CH 544848 A	15-01-1974
		DE 2208680 A	31-10-1973
		FR 2129443 A	27-10-1972
		GB 1381530 A	22-01-1975
		IT 957540 B	20-10-1973
		JP 55036761 B	24-09-1980
		LU 64878 A	06-07-1972
		NL 7202994 A, B,	12-09-1972
		NO 130598 B	30-09-1974
		SE 359593 B	03-09-1973
		US 3732021 A	08-05-1973

NIGEL BROOKS
RECEIVED

05 JAN 2001

DATE

BRIDGE JOINT

The present invention relates to a bridge joint, that is to say a joint between two sections of the roadway of a bridge.

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Bridge joints are required primarily because of thermal expansion and contraction in the roadway of a bridge. Also they accommodate initial contract on setting of concrete in the roadway and relative shear and rise/fall of adjacent roadway sections.

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The object of the present invention is to provide an improved bridge joint.

A bridge joint according to the invention comprises:

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- a plurality of roadway beams extending laterally of the roadway and including:
 - opposite edge beams having support formations extending therealong, the edge beams being adapted to be fixed to respective opposite ones of the roadway sections and
 - intermediate beams;
- a plurality of crossbeams extending between the opposite edge beams,
 - the crossbeams having end formations which are complementary to the support formations of the edge beams,
 - the crossbeams being supported by engagement of the end formations with the support formations, whereby the crossbeams remain mutually parallel as the edge beams move with respect to each other, at least whilst the edge beams remain parallel and
- the crossbeams and the intermediate beams being adapted for support of the intermediate beams on the crossbeams; and
- spacing features fixed on at least some of the crossbeams and co-operating with the intermediate beams for evenly spacing the latter.

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Normally the crossbeams will be of uniform length, whereby their angle with respect to the edge beams is determined by the separation of the edge beams and they are maintained parallel.

5 Preferably, the support formations are open, circular section grooves; and the crossbeams have spherical ends which fit the grooves. The grooves may be supplemented by support lips abutting the underside of the crossbeams, particularly where the edge beams are not expected to rise and fall with respect to each other.

10 Preferably, the spacing features are cams fixed to the crossbeams and acting on the intermediate beams. Whilst it is envisaged that the cams may be fixed to the top of the crossbeams; in the preferred embodiment, they are fixed to the bottom of the crossbeams. The intermediate beams have apertures through which the crossbeams extend, with the cams acting on bottom portions of the intermediate
15 beams.

To help understanding of the invention, a specific embodiment thereof will now be described by way of example and with reference to the accompanying drawing, in which:

20 Figure 1 is a cross-sectional side view of a bridge joint of the invention; and Figure 2 is an underside view of the bridge joint of Figure 1.

The bridge joint 1 shown in the drawings is set between two adjacent bridge roadway sections 2,3, which are liable to move by a small amount with respect to
25 each other. The joint has steel edge beams 4,5 arranged at the edge of the concrete C of the roadway sections. Each edge beam has a central section 6, which is generally square in cross-section, a horizontal flange 7, which is cast into the concrete and a vertical flange 8, which edges the concrete. The central section has a circular cross-section groove 9, which opens towards the gap G between the roadway sections and
30 the opposite edge beam.

Cross beams 10 are regularly spaced along the length of the joint, i.e. across the width of the roadway. They are of square section mild steel tube, with a stainless steel sheath 12 to improve their bearing qualities. To each end of the crossbeams, a

spherical steel ball 14 is fixed, as by welding or pinning. The balls are sized to fit in the groove 9. Thus the angle α which the crossbeams make with the edge beams is determined by the fixed length L of the crossbeams between the balls and the variable separation S of the edge beams. Whilst the edge beams remain parallel, the crossbeams will also remain parallel. To maintain the separation of the crossbeams, a number of spacer balls 15 is arranged in each groove 9 between each adjacent pair of crossbeam balls 14.

The crossbeams support a number, three as shown, of intermediate roadway beams 20. They are of general I-beam shape, with small grooves 21 in their heads 22. The edge flanges 8 of the edge beams also have such small grooves 21. Via these a diaphragm seal 23 is connected between each adjacent pair of roadway beams. These seals exclude water and dirt from the parts of the joint beneath them. The heads of the roadway beams provide the roadway surface between the concrete of the roadway sections 2,3. Feet 24 of the intermediate beams rest on the crossbeams. These transfer road loads to the edge beams via the balls 14 and lips 16 at the lower side of the mouth of the grooves 9.

To maintain the intermediate beams 20 evenly spaced, cams 17 are fixed to the underside of the crossbeams 10. They act against lower extensions 25 of the beams 20, the extensions being fitted to the beams after laying of them on the crossbeams. The joint is thus a coherent structure, which has a variable width. The cams are so shaped as to define a gap therebetween which is the same size as the thickness extensions 25, regardless of the angle α .

The invention is not intended to be restricted to the details of the above described embodiment. For instance the number of intermediate beams can vary. Since the intermediate roadway beams are stiff, the cams need not be provided on each crossbeam. The cams can be provided above the crossbeams, acting against the webs of the intermediate beams, if there is insufficient space for them to act against the beams' feet. For applications where little relative rise/fall is expected, the balls can be replaced by short studs, with flat bottoms bearing against flat bottoms to the grooves in the edge beams.

CLAIMS:

1. A bridge joint for joining two sections of a roadway of a bridge, the bridge joint comprising:

- 5 • a plurality of roadway beams extending laterally of the roadway and including:
 - opposite edge beams having support formations extending therealong, the edge beams being adapted to be fixed to respective opposite ones of the roadway sections and
 - intermediate beams;
- 10 • a plurality of crossbeams extending between the opposite edge beams,
 - the crossbeams having end formations which are complementary to the support formations of the edge beams,
 - the crossbeams being supported by engagement of the end formations with the support formations, whereby the crossbeams remain mutually parallel
- 15 as the edge beams move with respect to each other, at least whilst the edge beams remain parallel and
 - the crossbeams and the intermediate beams being adapted for support of the intermediate beams on the crossbeams; and
- 20 • spacing features fixed on at least some of the crossbeams and co-operating with the intermediate beams for evenly spacing the latter between the edge beams.

2. A bridge joint as claimed in claim 1, wherein the crossbeams are of uniform length, whereby their angle with respect to the edge beams is determined by the separation of the edge beams and they are maintained parallel.

25 3. A bridge joint as claimed in claim 1 or claim 2, wherein the support formations of the opposite edge beams are open, circular section grooves; and the end formations of the crossbeams are have spherical ends, sized to fit the grooves.

4. A bridge joint as claimed in claim 3, including a number of spacer balls arranged in each groove between each adjacent pair of crossbeam spherical ends to

30 maintain the separation of the crossbeams.

5. A bridge joint as claimed in claim 3 or claim 4, wherein the support formations include support lips along the edges of the edge beams, with the circular

grooves being set in from the support lips, and the crossbeams have flat undersides bearing on the support lips.

6. A bridge joint as claimed in any preceding claim, wherein the intermediate beams are perforate, with the crossbeams passing through perforations in the intermediate beams.

7. A bridge joint as claimed in claim 6, wherein the intermediate beams have flat under-surfaces for bearing on the crossbeams and lower extensions including the perforations, and the crossbeams have flat topsides for supporting the under-surfaces of the intermediate beams.

8. A bridge joint as claimed in any preceding claim, wherein the spacing features are cams fixed to the crossbeams and acting on the intermediate beams.

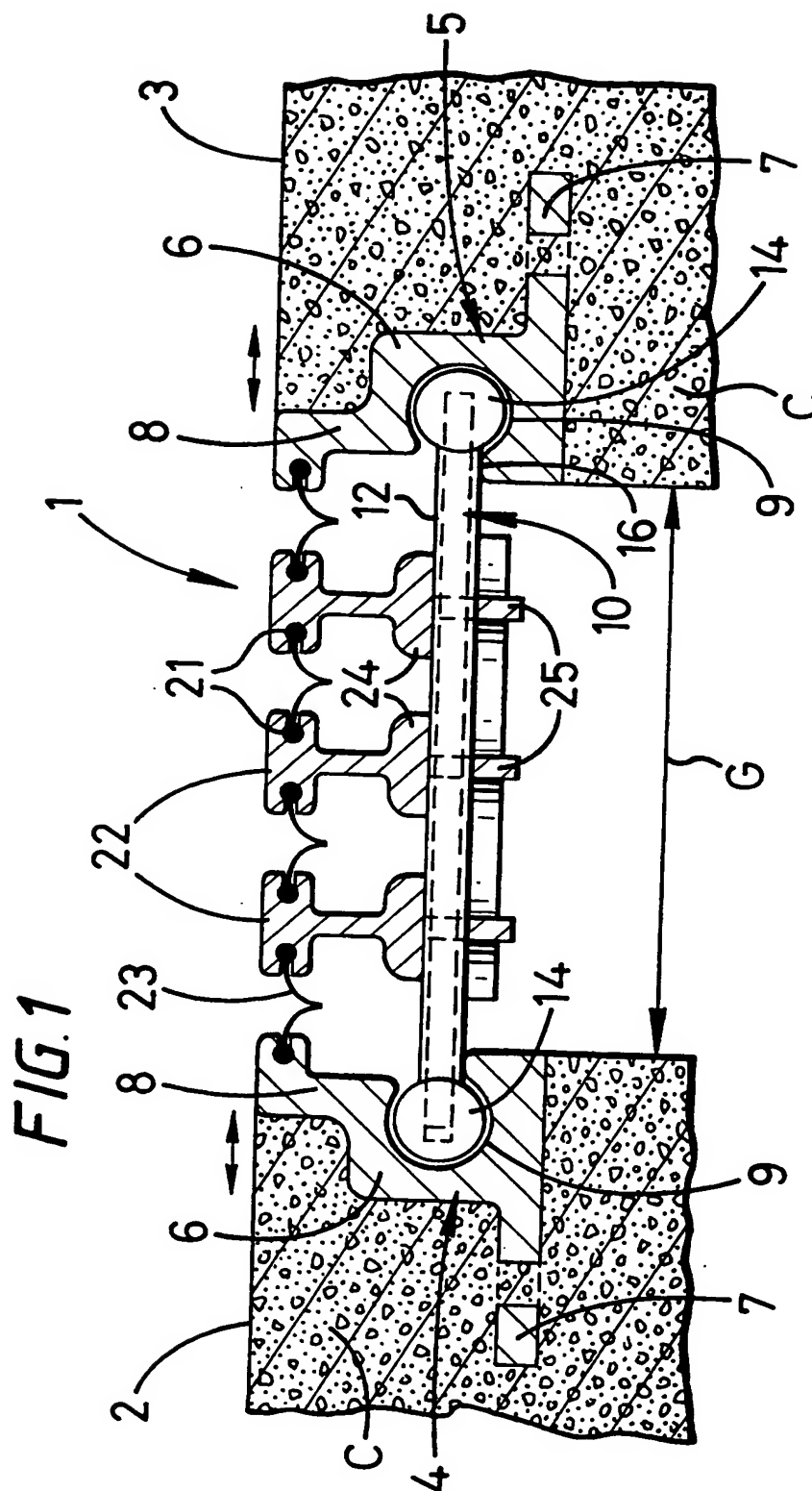
9. A bridge joint as claimed in claim 7, wherein the spacing features are cams fixed to the undersides of at least some of the crossbeams and acting on respective opposite faces of the lower extensions of the intermediate beams.

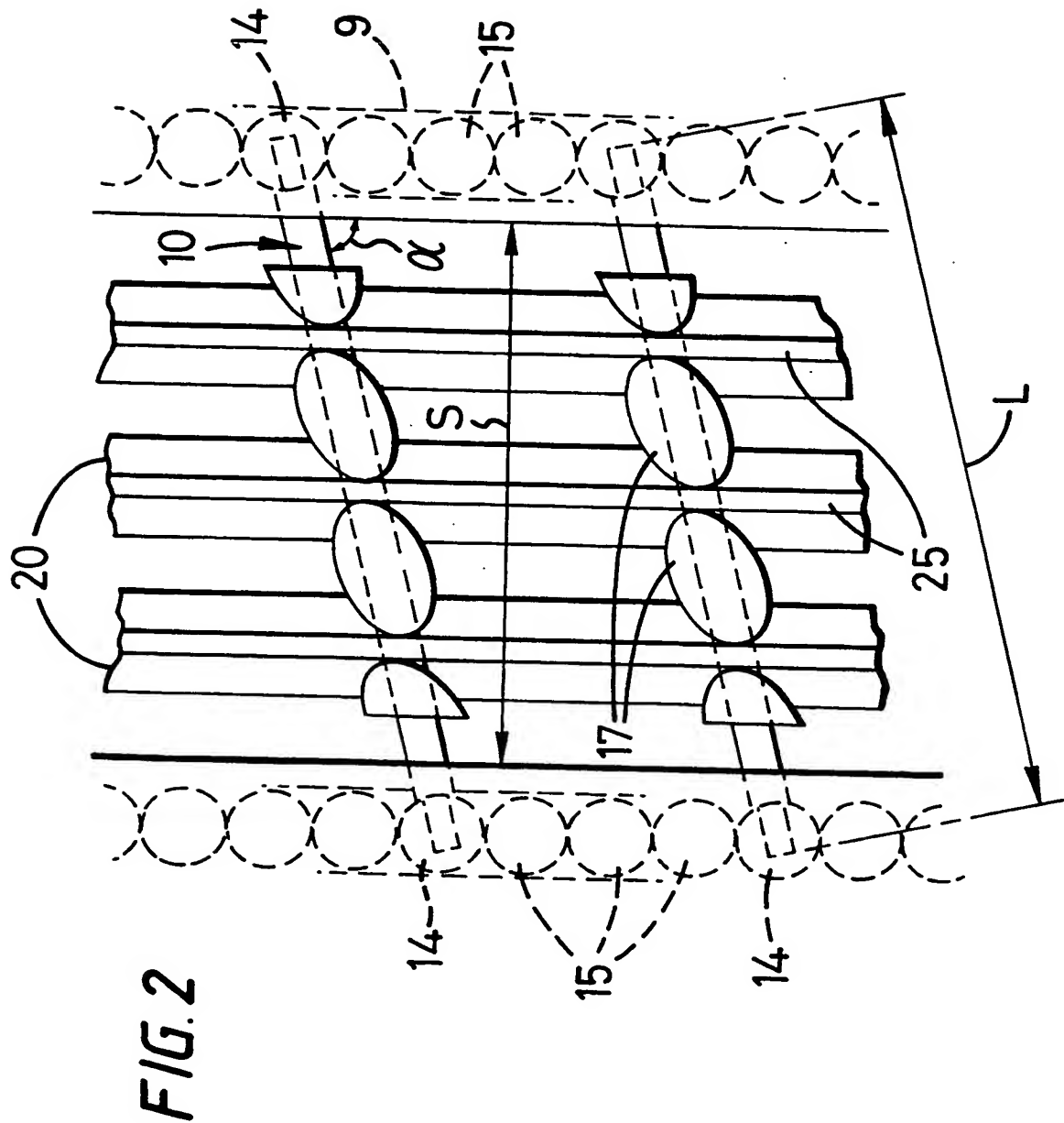
10. A bridge joint as claimed in any preceding claim, wherein the edge beams and the intermediate beams have heads with laterally opening grooves, diaphragm seals engaged in these grooves extending between respective adjacent pairs of these beams.

11. A bridge joint as claimed in any preceding claim, wherein the edge beams and the intermediate beams are solid steel beams and the crossbeams are of tubular steel.

12. A bridge joint as claimed in claim 11, wherein the crossbeams are of mild steel, with stainless steel sheaths.

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 00/02224

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 E01D19/06

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 E01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 030 156 A (RAYMOND PAUL J) 21 June 1977 (1977-06-21)	1,2,10
Y	the whole document	6,7
A		8,11
Y	US 3 880 540 A (RIZZA MICHAEL C ET AL) 29 April 1975 (1975-04-29)	6,7
A	abstract; figures	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

15 September 2000

Date of mailing of the international search report

22/09/2000

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 00/02224

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